

OBSERVATIONS ON THE OSTEOLOGY AND
NATURAL HISTORY OF THE AGAMID LIZARD
CTENOPHORUS FEMORALIS

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The *Ctenophorus maculatus* species group consists of five species of agamid lizards distributed over the arid regions of central and western Australia. The species are small to medium in size, largely terrestrial in habits and generally show strong colour matching to their substrate. They generally occupy hummock grass and open low woodland habitats on sandy substrates. They dig burrows only for their eggs, and they do not climb. When pursued they generally run behind or into clumps of low, dense vegetation. The biology of two species, *C. fordi* (Cogger 1974, 1978; Baverstock 1979) and *C. isolepis* (Pianka 1971) is known in some detail, but little beyond the basic taxonomy (Storr 1965) is known for the remaining three. This note provides some information on the second smallest and most geographically restricted species in the group, *C. femoralis* (Fig. 1). The information is based on observations of 57 specimens from 7 localities in the Australian Museum all of which were collected in early to mid-spring (25 Sept.-17 Oct.) of different years. The largest sample consists of 36 specimens from just west of Bullara homestead (22° 41'S, 114° 02'E). The range of *C. femoralis* is small (see below) and the localities for the specimens studied here are from the northern end of the range and separated by less than 1° of latitude.

Ctenophorus femoralis occurs only in a relatively small area of northwestern Australia between the Cane river and an area southeast of Lake MacLeod (Storr *et al.* 1983). The range extends over less than 3° of latitude just north of the Tropic of Capricorn and lies within 100 km of the coast. *Ctenophorus femoralis* occurs only in open habitats and although reported as occurring on a variety of substrates — loose sand, heavy loam, and stony, clayey soils (Storr 1965), appears to be most often associated with sand substrates, especially dunes (Storr and Hanlon 1980; Storr *et al.* 1983; Storr and Harold 1984, 1985). At the two localities where I have observed the species most closely — just west of Bullara homestead and southeast of Giralia homestead, it occurred predominantly on the crests and upper flanks of the dune, while the only other species in the group in each area, *C. maculatus* and *C. rubens*, respectively, occurred primarily on the lower flanks and interdune areas (Fig. 2). Whether these complementary distributions reflect habitat choice or competitive interactions is unknown. At other localities *C. femoralis* has been recorded microsympatrically with *C. isolepis* and *C. maculatus* (Storr 1965).

The large sample from just west of Bullara Homestead was X-rayed for osteological details. Presacral vertebrae ranged 22-24 (\bar{x} = 22.9, SD = .42, N = 36); postsacral vertebrae 52-59.5 (\bar{x} = 55.4, SD = 1.79, N = 31); and postsacral vertebrae with paired diapophyses 12-15.5 (\bar{x} = 13.6, SD = .80, N = 35). These counts are fairly typical for Australian agamids (pers. obs.). There were no significant sexual differences in any of these features. Two of the 36 specimens (5.5%) X-rayed had a sacral vertebrae.

The phalangeal formula for *C. femoralis* is 2.3.4.5.3/2.3.4.5.4 (manus/pes) the primitive condition for agamids. Variation in this feature is almost nonexistent. Phalangeal counts for each digit in the Bullara sample were as follows (both sides where possible): 2(N = 59) .3(59) .4(63) .5(64) .3(65)/2(66) .3(64) .4(65) .5(65) — 6(1) .3(66). Hence the only variation is the one unilateral case of 6 instead of 5 phalanges in the fourth toe of the pes — an increase of one over the primitive number. This shows that phalanges can be gained as well as lost in evolution.

In the Bullara Homestead sample males on average were larger than females

(mean SVL = 47.9 vs 45.4; SD = 2.96 vs 2.99, N = 21 vs 15; $t = 2.54$, $P = .02$). In *Ctenophorus fordi*, the only other member of the *C. maculatus* group in which sexual size dimorphism has been studied, "females tend to be somewhat larger than males" (Cogger 1975).

In the total sample, all the specimens bar one, a female of SVL 37 mm, are mature. The thirty-four mature males range from 41 to 53 mm and have moderate sized to large, white to pale yellow testes and large, dark brown to black epididymides; the twenty-two mature females range from 43 to 52 mm. Of these latter, six carry yellow follicles and nine carry shelled oviducal eggs. The seven non-gravid mature females (SVL: 44-50 mm, $\bar{x} = 46.2$) have enlarged oviducts but only small, white to very pale yellow follicles and no corpora lutea; these females are presumably either between clutches or preovulatory. The 15 yolking and gravid females (SVL: 43-52 mm, $\bar{x} = 47.5$) carry 2-3 ($\bar{x} = 2.1$) eggs. None of the nine females with oviducal eggs have any enlarged, yolking follicles. There is no relationship between female size and



Figure 1: *Ctenophorus femoralis* from approximately 5.2 km SE of Giralia homestead (by road), W.A. Photo: A.E. Greer.



Figure 2: Habitat of *Ctenophorus femoralis* approximately 5.2 km SE of Giralia homestead (by road), W.A. *C. femoralis* occurred predominantly on the dune crest and upper slopes; *C. rubens* occurred on the flats and lower slopes. Photo: A.E. Greer.

clutch size ($r = .33$, NS); this is in strong contrast to most Australian agamids in which there is a positive relationship (pers. obs.). Mating was observed once, on 14 October.

These observations suggest that the animals mature within one year (no distinct juvenile class), and that mating and ovulation occur in spring, presumably followed by egg laying. It would appear, therefore, that much of the general reproductive period coincides with the early spring to mid-summer dry season.

Whether or not *Ctenophorus femoralis* is an annual, i.e. experiencing heavy adult mortality before the second reproduction season, is unknown. Certainly the smallest species in the *C. maculatus* species group, *C. fordi*, is an annual (Cogger 1974; Baverstock 1979) and the second largest, *C. isolepis*, may be (Storr 1965; Pianka 1971). The fact that juvenile and apparently healthy, active adult *C. femoralis* have been observed together on 31 May (2.5 km E of Giralia Homestead; G. Shea, pers. comm.) suggests that in *C. femoralis* at least some adults survive into the winter.

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SPECIMENS EXAMINED

Australian Museum R 81299-300: 40 km from Port Hedland Hwy on Giralia road (17 Oct. 1975); 81407-09: Giralia Station (16 Oct. 1978); 101484-85, 101490, 101582: 32.2 km SE of Onslow by road (11-12 Oct. 1981); 101502: old rubbish tip on south side of Onslow (12 Oct. 1981); 101505-28, 101539-47, 101586-88: approx. 2.7 km W of Bullara homestead by road (13-14 Oct. 1981); 101965: approx. 65 km S of Exmouth P.O. by road (17 Oct. 1981); 117620-23, 117805-10: approx. 5.2 km SE of Giralia homestead (25-26 Sept. 1985).

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